REVISED SYNOPSIS

A SYSTEMS APPROACH FOR ANALYSIS OF BIO-MEDICAL WASTE MANAGEMENT IN HOSPITALS

For the Award of Doctor of Philosophy (Ph.D.) in Management

Submitted by

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INTRODUCTION

A hospital is a center that provides various health-care services include curative, rehabilitation, preventive and promotion of health education to community. In undertaking these activities, the hospital may also generate wastes both from medical and non-medical activities. The infectious components in the hospital wastes could pose a potential risk to the patients, neighboring communities, hospital staff (especially waste workers), visitors and even the surrounding environment. The exponential growth of Health Care Units (HCU) such as hospitals and dispensaries in India generate immense health care wastes, creating an alarming situation for local governments and environment. The health care units generate waste during the process of diagnosis and treatment can be hazardous, toxic and even lethal due to the presence of pathogens in sufficient concentration or quantity that could result in transmission of infectious diseases. It is identified that medical waste can cause adverse effect on human health and environment. Doxin and mercury are potentially hazardous pollutants generated from incinerator due to significant amount of ash emission in air (Kaiser, et al., 2001).

1.1. Bio-Medical Waste Management

Public concern about medical waste dates back to early 1980's when large quantities of syringes and needles were found on the beaches of the East coast in Florida, United States of America. The public got scared of spreading infectious diseases from this waste led to the first legislation on biomedical waste management in USA. Later, other countries adopted similar legislation to dispose their biomedical waste effectively. The government of India notified the National Bio-Medical Waste (Management and Handling) Rules in July 1998. This was published by the Government of India, under Sections 6, 8 and 25 of the Environmental Protection Act, 1986 on the 20 July 1998 and appeared in official gazette of India on the 27 July 1998. All the health care facilities in the country are covered under these rules, making it mandatory for health facilities to manage their waste.

As per the Biomedical Waste (Management and Handling) Rules (1998) of India, "Biomedical waste'' means "any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biological, and including categories mentioned in Schedule 1".

Table 1.1 Categories of Bio-Medical Waste

Color Code (Bag)	**Waste Type**	**Treatment**
Yellow	Human Anatomical Waste	Incineration
	Animal Waste	
	Discarded Medicine and Cytotoxic Drug	
	Solid Waste(item contaminated with blood and body fluids)	
Red	Microbiology and Biotechnology waste and their laboratory waste	Disinfection at source by chemical treatment/ Autoclaving/ Microwaving followed by mutilation/Shredding then final disposal in secured landfill or disposal of recyclable waste through authorized recyclers.
	Waste Sharp	Disinfection at source by chemical treatment/ Autoclaving/ Microwaving followed by mutilation/Shredding then final disposal in secured landfill or disposal of recyclable waste through authorized CBWTF or in secured landfill or designated concrete waste sharp pit.
	Infectious Solid Waste (such as Catheters, Hand gloves, Saline Bottles etc.)	Disinfection at source by chemical treatment/ Autoclaving/ Microwaving followed by mutilation/Shredding then final disposal in secured landfill or disposal of recyclable waste through authorized recyclers
Blue	Chemical Waste (Disinfection and insecticides etc.)	Chemical Treatment and discharge into drains meeting the norms and solid disposal in secured landfill
Black	Municipal Waste	Disposal in municipal dump site

Source: The Bio Medical Waste (Management and Handling) Rules, 2011, (Ministry of Environment and forest)

1.2. Sources of Bio-Medical Waste

While urban solid waste attracted the attention of town planners, environmental activists and civic administrators; there is yet lack of concern for some special sources of waste and its management. One of such waste is bio-medical waste generated primarily from health care establishments, including hospitals, nursing homes, veterinary hospitals, clinics and general practitioners, dispensaries, blood banks, animal houses and research institutes.

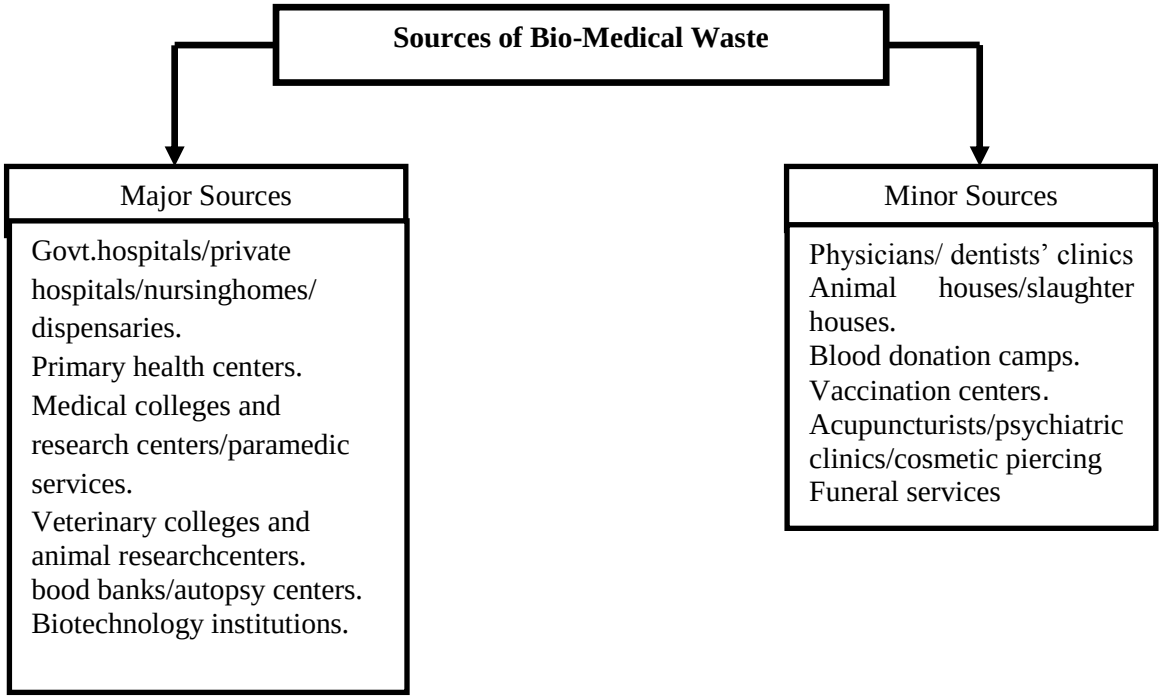

Fig. 1.1 Sources of Bio-Medical Waste

1.3. Classification of Bio-Medical Waste

Approximately 75-90% of the biomedical waste is nonhazardous and as harmless as any other municipal waste. The remaining 10-25% is hazardous and can be injurious to humans or animals and deleterious to environment. It is important to realize that if both these types are mixed together then the whole waste become shameful (Pasupathi et al., 2011). World Health Organization states 85% of hospital wastes are actually non-hazardous, where as 10% are infectious and 5% are non-infectious but they are included in hazardous wastes.

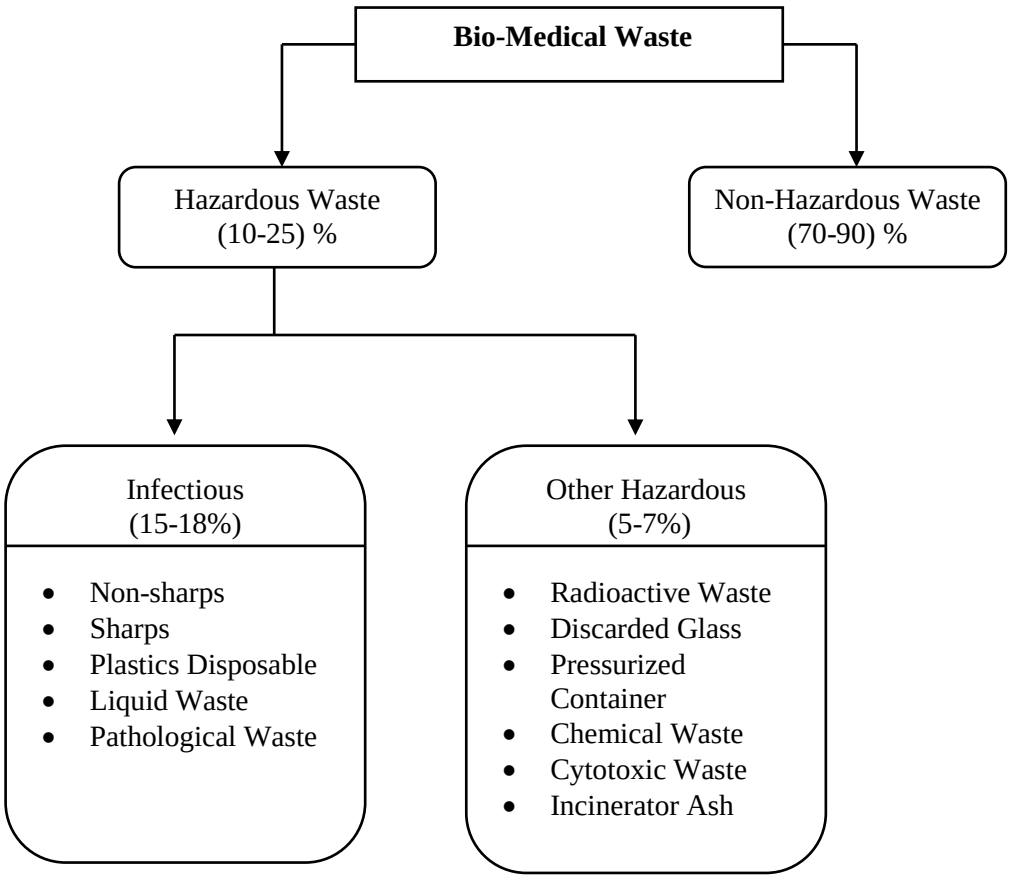

Fig 1.2 Classification of Bio-Medical Waste

1.4. Bio-Medical Waste Management System: Indian Perspective

The Government of India (notification, 1998) specifies that Hospital Waste Management is a part of hospital hygiene and maintenance activities. Bio-Medical Waste Management encompasses activities for a safe and scientific management of health care waste which is mandatory to be adopted by health care establishment. However, disposal of biomedical waste need to be carried out in way that neither the environment nor the health conditions of people are put at risk as they are hazardous. Segregation is a critical step for effective bio-medical waste management. Improper bio-medical waste management can deteriorate living environment and eventually threaten the public health. Therefore for effective management of bio-medical waste management is a primary concern for health of public and environment.

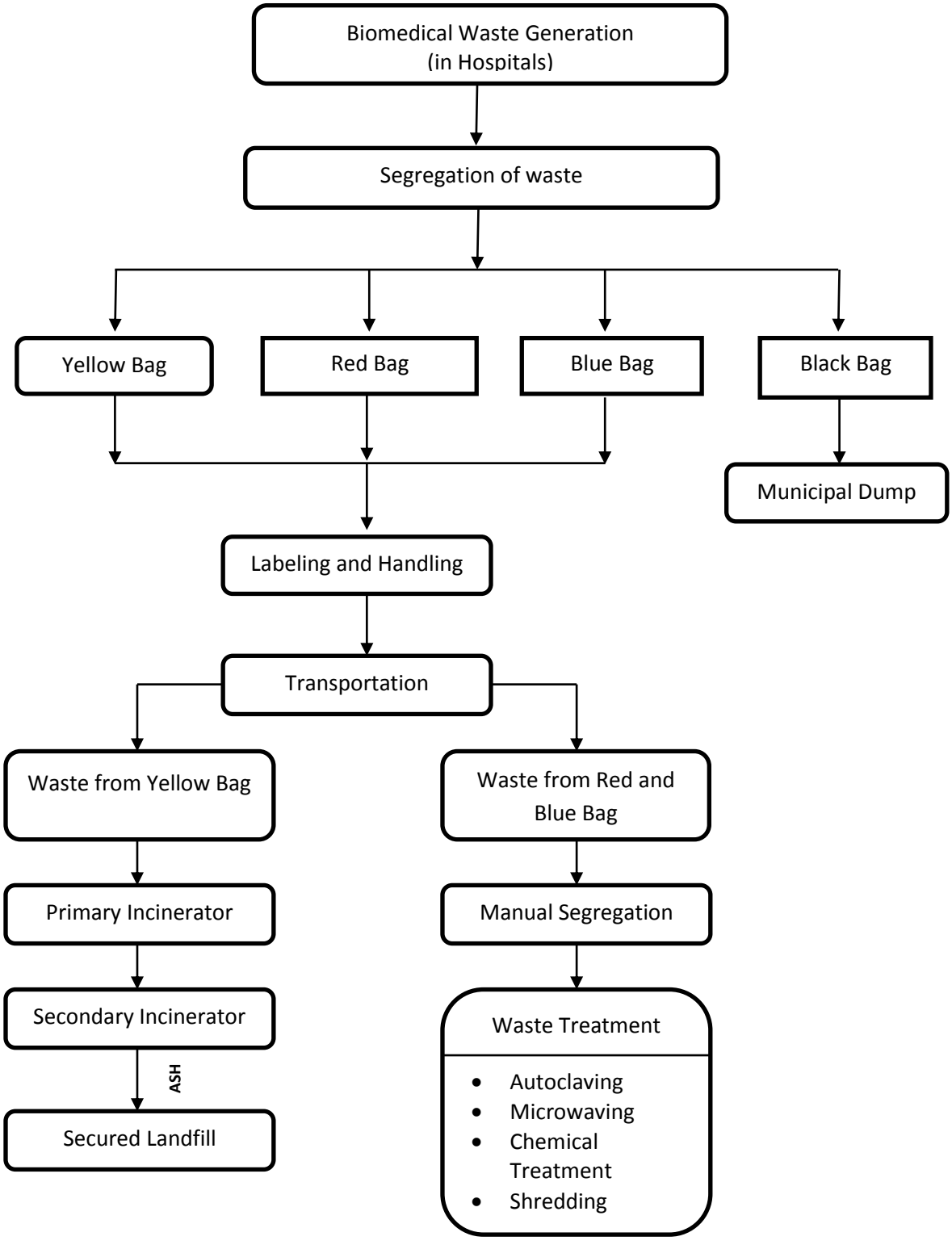

Figure 1.3 Flowchart of biomedical Waste Management

1.5 Bio-Medical Waste Treatment and Disposal Facilities

The bio-medical waste legislation elaborately mentions the recommended treatment and disposal facility according to different categories of waste generated in health care establishment. Different methods were developed for rendering sustainable biomedical waste management. Bio-Medical Waste treatment technologies are generally categorized into incineration non-incineration technology (Daiz, et al., 2005). Non-incineration technologies of disposal of bio-medical waste management are given below:

- Auto Claves
- Shredders
- Microwave Irradiation
- Chemical methods
- Plasma Pyrolysis

1.6 Environmental and Health Risk of Bio-Medical Waste

Improper disposal of bio-medical wastes cause significant environmental and health Risk. In many developing countries, an overall management of the biomedical waste is still an exception and not a rule

The hazardous nature of the biomedical waste is due to the following:

- Infection
- Toxicity
- Exposure to radioactivity
- Injury

World Health Organisation confirms that the healthcare activities lead to the production of waste that can have adverse health effects. Although most of this waste is not more dangerous than regular household waste, some types of healthcare waste represent a higher risk to health: these include infectious waste (15% to 25% of total healthcare waste) among which are sharps waste (1%), body part waste (1%), chemical or pharmaceutical waste (3%), and radioactive and cytotoxic waste or broken thermometers (less than 1%). Sharps waste, although produced in small quantities, is highly infectious. Improperly managed waste can put healthcare workers, waste handlers and the community

to infections. Contaminated needles and syringes represent a particular threat and may be scavenged from waste areas and dump sites and be reused.

Epidemiological studies indicate that a person who experiences one needle-stick injury from a used needle can be a source of infection. In 2002, the results of a WHO assessment conducted in 22 developing countries showed that the proportion of healthcare facilities that do not implement proper waste disposal methods ranges from 18% to 64%. Inadequate waste management can cause environmental pollution, growth and multiplication of vectors like insects, rodents and worms and may lead to the transmission of diseases like typhoid, cholera, hepatitis. Negligence in biomedical waste management contributes to environmental pollution, sickness of humans/animals, and depletes natural as well as financial resources (Henry & Heinke, 1996; Oweis et al., 2005). Infected cotton may be used for making ear buds and toys. Syringes from waste are often repacked and sold as new packs. World Health Organization states that 85% of hospital wastes are actually non-hazardous, whereas 10% are infectious and 5% are non-infectious but they are included in hazardous wastes. About 15% to 35% of Hospital waste is regulated as infectious waste. This range is dependent on the total amount of waste generated (Glenn & Garwal, 1999). Previous studies indicate that high-income nation generate 1.1–12.0 kg/person/year, middle-income nations generate 0.8–6.0 kg/person/year and low-income nations generate 0.5–3.0 kg/person/year. Medical waste generated at different health care facilities presents environmental and public health risks. An inappropriate treatment and disposal can spread infectious diseases like tuberculosis, hepatitis, enteric fever, AIDS (Emmanuel et al., 1999; Halbwachs, 1994). A study conducted by World Health organization, 1996 revealed that more than 50,000 people die every day from infectious diseases. One of the causes for the increase in infectious diseases is improper waste management. Blood, body fluids, and body secretions which are the constituents of bio medical waste harbor most of the viruses, bacteria, and parasites that cause infection. Tuberculosis, pneumonia, diarrhea diseases, tetanus, whooping cough etc. is other common diseases spread due to improper waste management. Health care workers are not very much aware of risk associated with biomedical waste (Kotch, 2007). Improper disposal such as open dumping and uncontrolled burning of biomedical waste in health care establishment create a potential risk for health

care worker and the surrounding environment because these wastes are infectious and hazardous (Bokhoree et al.,2014).

1.7. Status of Bio-Medical Waste Management in India

In India, there are 1,68,869 Health Care Facilities (HCF), having 17,13,742 beds and generating bio-medical waste is about 484 tons/day and 1,05,270 Health Care Facility have obtained authorization under the BMW Rules. There are 198 Common Bio-Medical Treatment Facilities in operation (28 under construction) as well as 22,245 no. of Health Care Facilities are having captive bio-medical waste treatment and disposal facilities in India. 447 Tons per day (TPD) out of 484 TPD of bio-medical waste generated is treated and disposed of by these facilities (Central Pollution Control Board, 2013).

According to health information statistics 20% of total beds are in rural hospitals while 80% are in urban hospitals. Extrapolating from past figures of number of beds and average quantity of waste generation at the rate of 1 kg per bed per day, it is estimated that about 0.33 million tonnes of hospital waste is being generated per year (Patil & Shekdar, 2001). In India, with exception to a few large hospitals, most of the smaller hospitals and nursing homes lack any effective system to safely dispose off their waste. Even the Government and municipal hospitals are no better than the private nursing homes in this regard. Wastes generated during diagnosis such as used bandages, syringes, human tissues are dumped in the open bins on the roadsides or low lying area or directed into the water bodies. Thus, an unauthorized reuse of medical wastes by rag pickers is being promoted through irresponsible dumping of these dangerous wastes into open bins which cause infectious disease (Dwivedi et al., 2009). Tuberculosis (TB) and HIV combined together is major threat for the human health. Hepatitis B and C infections are on the rise. Mortality due to Hepatitis C has gone up significantly (Verma, 2010). A study conducted by the Central Pollution Control Board (CPCB), an apex pollution monitoring body of Government of India, on incinerators in Delhi Hospitals, concluded that the incinerators were found to spew a high level of deadly residues and toxic emissions such as

cancer-causing dioxins and furans besides chemicals which cause neonatal abnormalities, reproductive and skin disorders, endocrine disruption and suppression of the immune system.

2. ISSUES ASSOCIATED WITH BIO-MEDICAL WASTE MANAGEMENT SYSTEM IN INDIA

Biomedical Waste Management practices are getting attention due to environmental and health concern. There are various issues and challenges associated with biomedical waste management in India are listed below:

2.1. Lack of awareness and Training

Lack of awareness waste among staff of health care establishments is main cause of improper disposal of biomedical waste (Babu et al., 2009). Main cause of improper disposal of waste is lack of tarring among health care personnel of health care unit (Sumi, 2010).

2.2. Unclear role of local authorities

The regulatory authority should monitor and supervise all Health Care Facilities including government as well as private for the effective implementation of the law but the regulatory authority visits are infrequent to monitor HCEs. The same issues are in no one's preview. (Sheth & Jhala, 2014)

2.3. Relationship between Health Care Establishments and Common Biomedical Waste Treatment Facilities

The existing relationship of Health Care Establishments and Common Biomedical Waste Treatment Facility (CBWTF) operator reflects shunning the responsibilities on one another. On one hand the HCE handover the unconditional responsibility of the entire biomedical waste generated at their facility to the CBWTF. On the other hand, the CBWTF operator takes no responsibility of segregation before pre-treatment of the biomedical waste collected from different HCEs (Seth & Jhala, 2014).

2.4 Lack of Segregation Practices

Segregation practice prevents non-infectious waste to get mixed with infectious waste. Lack of segregation practices significantly increases the quantity of infectious medical waste as mixing of infectious component with the general non-infectious waste, makes the entire mass potentially infectious (Gupta & Bhoojh, 2006). There is inadequate practice of segregation of the waste starting from generation to disposal as seen in Indian hospitals. Even if the segregation of waste at the point of generation is effective, waste handlers are found mixing it together during the collection and results in loss of ultimate value of segregation (Gupta & Bhoojh, 2006).

2.5 Lack of Proper Operational Strategy

Operational plans should include the location and capacity of the storage containers, frequency of collection for various types of wastes and schedule of activities. Infectious wastes are to be stored in the designated colour-coded leak-proof containers for safe handling Transportation of waste within the hospital is to be carried out in closed handcarts to avoid spillage of waste to a disinfection or treatment facility. After disinfection/sterilization, the waste is transported to a common treatment facility, such as an incinerator or controlled landfill. (Patil & Shekdar, 2001)

2.6. Financial Constraints

For installing effective system in most of the Health Care Units, Huge financial investment is necessary. Normally, a separate allocation of funds for waste management is not found in Indian hospitals. It is estimated that INR 3000–4000 (US$ 70–93) per tonne of hospital waste is required (Patil & Shekdar, 2001). Additionally funds are required for conducting training and awareness programs for health care staffs. Smaller HCUs ignore waste management practices due to financial constraints.

2.7. Waste-picking and Reusing

Reuse of plastic syringes and other plastic material used in the health care is a thriving business of billions of Indian Rupees. More than one million people are engaged in rag picking (more than 100,000 in Delhi alone). The estimated figure of business on this score in Delhi alone is more than 50 million Indian Rupees per year. (Verma, 2009)

2.8 Lack of Adequate Facilities

Efforts to provide facilities for storage, collection, treatment and disposal of health care wastes as well as appropriate technologies have so far been limited in India. Additionally, adequate and requisite number of sanitary landfills is lacking in India. Therefore, the biomedical waste are openly dumped into the open bins on the road sides, low lying area or they are directed into the water bodies; through which severe disease causing agents are spread into the air, soil and water (Dwivedi et al., 2009).

3. LITERATURE REVIEW

For the purpose of this study, a detailed review of relevant literature is conducted on the biomedical waste management to understand the biomedical waste management system and problems related to improper disposal of biomedical waste. The review is first classified in two broad categories *(Ref Fig.* 1.5)

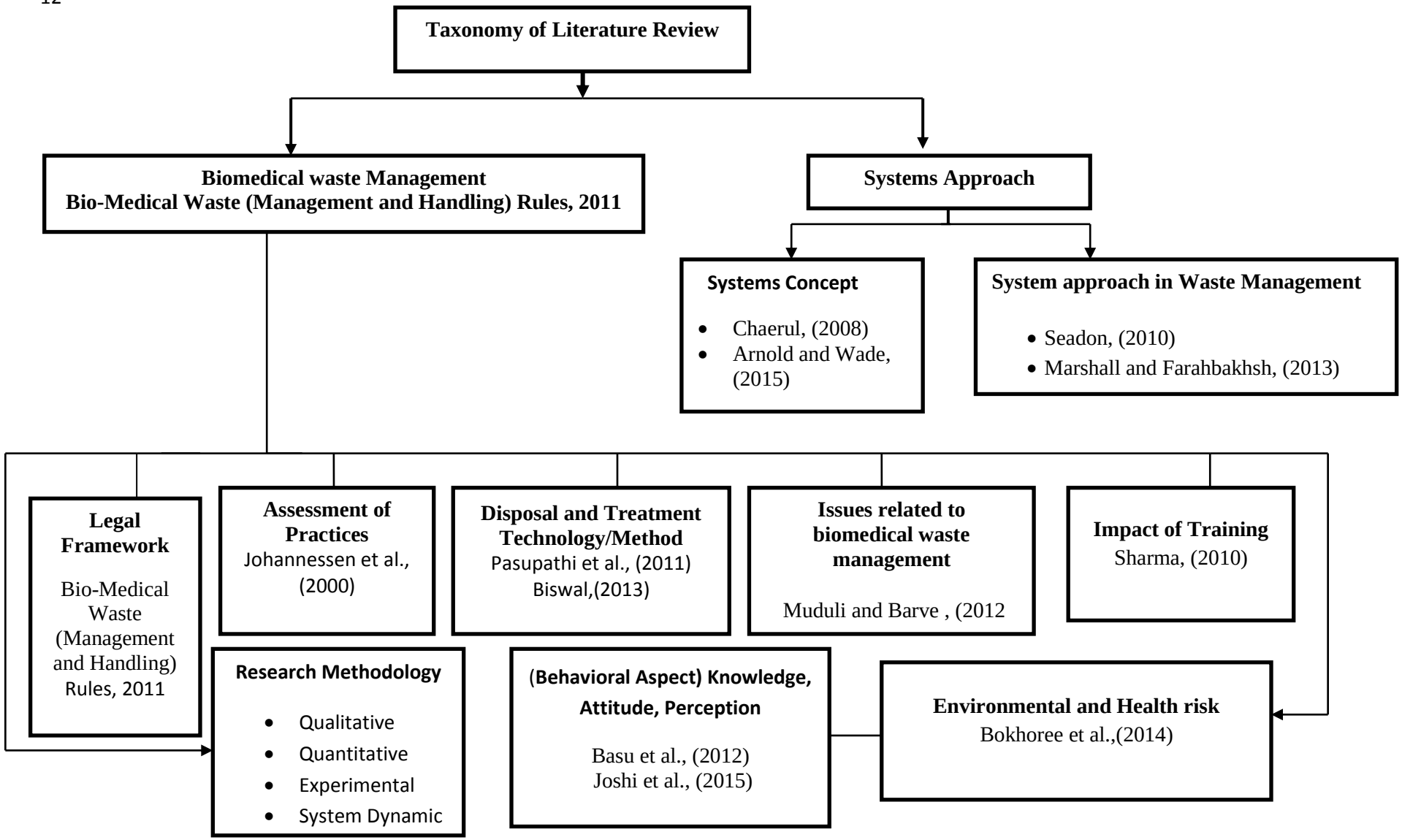

Fig 1.5 Snapshot of Review of Literature

3.1. Bio-Medical Waste Management

This Category focuses on detail of biomedical waste management. This category includes articles produced by researcher who give detail of bio-medical waste management practices and

3.1.1. Legal Framework

In this category, focus was given on legal framework of biomedical waste management and its component. Biomedical Waste (Management and Handling) Rules 2011 has elaborately mentioned the recommended treatment and disposal options according to the different categories of waste generated in hospitals and from other sources.

As per this rule every occupier of an institution generating bio-medical waste which includes hospitals, nursing home, clinic, dispensary, veterinary institutions, animal house, pathological laboratories, blood banks to take all steps to ensure that such a waste is handled without any adverse effect to human health and environment. Every occupier of an institution generating, collecting, receiving, storing, transporting, treating, disposing and/or handling bio-medical waste in any other manner, except such occupier of clinics, dispensaries, pathological laboratories, blood banks providing treatment/service to less than 1000 (one thousand) patient per month, shall make an application in Form 1 to the prescribed authority for grant of authorization. Every operator of a bio-medical waste facility shall make an application in Form 1 to the prescribed authority for grant of authorization. A fee as may be prescribed by the Government of the State or Union Territory shall accompany every application in Form 1 for grant of authorization. Bio-medical waste shall be treated and disposed of in accordance with Schedule I, and incompliance with the standards prescribed in Schedule V. Every occupier, where required, shall set up in accordance with the time schedule in Schedule VI, requisite bio-medical waste treatment facilities like incinerator, autoclave, microwave system for the treatment of waste, or, ensure requisite treat. The Biomedical waste management rule, 1998 mainly comprised of 6 schedules.

3.1.2. Practices of bio-Medical Waste Management

Proper management of medical waste can minimize the risk both within and outside healthcare facilities (Johannessen et al., 2000). Most of studies were carried on the assessment of Bio-Medical Waste practices but less number of studies were carried out on environmental auditing of the Biomedical Waste Management practices. The practice of Segregation of hospital waste is necessary for the safe and efficient management of biomedical waste, especially infectious wastes from the noninfectious waste (Tiwari & Kadu, 2014). The management of health care waste in India is not satisfactory. In India, biomedical waste generated from health care units are generally not segregated and disposed in municipal bins located either in-side or outside the facility premises (Lakshmi, 2003). An unauthorized reuse of medical wastes by rag pickers is being promoted through irresponsible dumping of these dangerous wastes into open bins (Dwivedi et al., 2009).

3.1.3. Disposal and Treatment Facilities of Bio-Medical Waste

This category includes the studies that focused on different methods and technology for disposal and treatment of bio-medical waste. The previous studies demonstrate that there is not a single method of biomedical waste treatment or disposal that completely eliminates all risks to humans or to environment (Rutala et al.,1989; Sheth et al., 2006; Stamenkovic & Kralj, 2007). Pasupathi et al., (2011) described all techniques in detail used for the disposal of bio-medical waste. Biswal, (2013) gave detail disruption of infectious liquid biomedical waste disposal and treatment methods.

3.1.4. Knowledge, Attitude and Perception towards Waste Management

This subcategory covers studies focusing on the knowledge, awareness and attitude of health care personal and staff who are responsible for handling the bio-medical waste management. Lack of knowledge and awareness towards legislations on bio-medical waste management are even among qualified hospital personnel (Sharma, 2010; Basu et al., 2012; Babu et al., 2009). As a consequence there is inappropriate practice of Biomedical Waste handling and management, thus exposing

themselves and general public to health and environment hazards. Joshi et al., (2015) carried out qualitative study on the perception of staff of Rural Tertiary Care hospitals in Ujjain, India.

3.1.5. Impact of Training on Bio-Medical Waste Management

Healthcare workers play key role in the management of bio-medical waste so it is important to train them regarding their safety & harm associated with the mismanagement of bio-medical waste (Sharma, 2010). There is a need to evolve a continuing education programme for healthcare personnel to make them aware about the proper management of Biomedical Waste management (Gupta et al., 2012).

3.1.6. Environmental and health Risk of Bio-Medical Waste

Biomedical waste is very critical waste as compared to other types of wastes because of its high potential of causing infection and injury (Alhumoud, 2007). Medical waste needs to be carried out in a way that neither the environment nor the health conditions of people are put at risk as they are hazardous.Poor management of medical waste this may be problematic to the health of workers, patients and public (Bokhoree et al.,2014). Environmental impact of biomedical waste is air pollution, radioactive emission, water pollution, land pollution (Sadhu and Singh,2003; Babu et al., 2009). Extensive research conducted in the last decades has established that the appropriate management of health care wastes significantly reduces the risks to the environment (Fay et al., 1990; Pruss et al., 1999; Tsakona et al., 2007).

3.1.7. Issues associated with Bio-Medical Waste Management

This category includes articles that describe the challenges and problems which hinder the effective implementation of biomedical waste management in health care establishment. The process of biomedical waste management involves critical issues like illegal scavenging, lack of awareness, financials constraints, environmental safety etc. (Seth & jhala, 2014; Muduli & Barve , (2012).

3.2. Systems Approach

The systems movement began during 1940. It is a set of activities to search the consequences of holistic rather than reductionist thinking. According to the Merriam-Webster dictionary, a system is defined as a regularly interacting or interdependent group of items forming a unified whole (Merriam-Webster's online dictionary). Systems approach helps modelers and decision makers to conceptualize and analyze the structure, interactions and mode of behavior of complex systems and sub-systems to assess and forecast their impacts in an integrated and holistic manner (Chaerul, 2008). Arnold and Wade (2015) defined systems thinking elaborately. **C**omputer-assisted decision become more common in policy making in current year because policy makers are facing increasing demands for accountability, many software packages are available to facilitate modeling using the System Dynamics theme (Rubenstein-Montano & Zandi, 2000). However, the traditional Solid Waste Management approach is reductionist, not customized to deal with complexity (Seadon, 2010). Marshall and Farahbakhsh, (2013) explained the need of systems approach to integrated solid waste management in developing countries.

4. THEORETICAL FRAMEWORK OF STUDY

A theoretical framework has been proposed based on the objectives and previous literature available on this field. The model helps to study existing legal framework which provides safeguard to environment and public health. It is mandatory to each hospital to comply these rules and regulation for sustainable disposal of biomedical waste management. The proposed model will provide a sound base and will help in further examination. Government of India framed legal framework and guideline for sustainable biomedical waste management. It is mandatory to every hospital to comply these guidelines / frameworks for effective implementation of biomedical waste management but these guidelines are not complied by hospitals properly which poses risk to environment and society. Sustainable implementation of biomedical waste management is affected by various issues and

challenges. Therefore, it is necessary to find out problems that affect sustainable implementation of biomedical waste management.

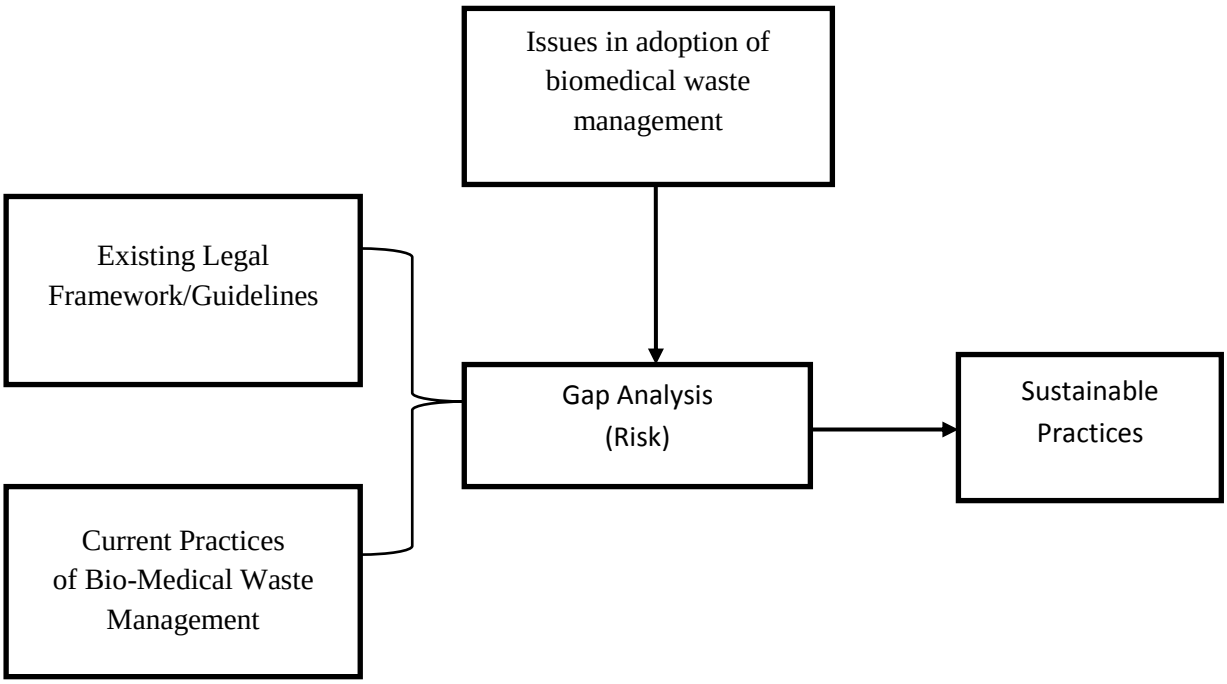
Issues in adoption of biomedical waste management
Existing Legal Framework/Guidelines
Gap Analysis (Risk)
Sustainable Practices
Current Practices of Bio-Medical Waste Management

Fig 1.6 Theoretical Framework of Study

5. OVERVIEW OF PROPOSED STUDY

5.1. Need of the study

Hospital is one of the complex establishments, which is visited by every people of community. Biomedical Waste Management is receiving greater attention due to inadequate management of biomedical waste can cause risks to health care workers, patients, communities and their environment. Government of India has framed Bio-Medical Waste (Management and Handling) Rules 1998 making it mandatory for health-care facilities (HCFs) to properly dispose bio-medical waste. However, the institutions do not comply with the rules and the conditions within them are pathetic. Therefore, there is urgent need to improve upon the medical waste management practice. Hence, systematic and planned approach to deal with the infectious or bio-medical waste is required to guide the hospital management in particular towards better medical waste management practice. The most common problems associated with health care wastes are the absence of waste management, lack of awareness

about their health hazards, insufficient financial and human resources for proper management and poor control of waste disposal (Nagaraju et al., 2013). Therefore, proposed study will be conducted to assess practices regarding bio-medical waste management of hospital to help the authorities to develop the strategy for improving the situation in future.

5.2. Objectives of the Study

The proposed study has the following objectives

Objective 1: To assess the quantum of waste generated by hospitals in Agra**.**

Objective 2: To assess the Bio-Medical Waste management practices in hospitals of Agra.

Objective 3: To apply systems approach to understand the interaction among the various issues of Bio-Medical Waste Management in hospitals of Agra

Objective 4: To develop action plan for effective and sustainable Bio-medical Waste Management system in Agra.

6. RESEARCH DESIGN, TOOLS AND METHODOLOGY

This research will be descriptive research study based on survey technique. Systems approach will be applied to understand issues related to systems. In order to make study more reliable, date from both primary and secondary sources will be collected. Primary data will be collected from the selected study sample using the appropriate sampling technique.

6.1. Scope of the Study

Proposed study will be carried out in hospitals of Agra situated in Uttar Pradesh of Northern India. Hospitals of Agra were selected for the study because it is most visited place of Tourists. It is best known for the TajMahal and other historical monument like Agra Red Fort, Itimad-ud-Daula's tomb etc. World famous TajMahal and other monuments are under constant threat from the ever-increasing environmental pollution. Bio-medical waste is critical waste which is the source of environmental pollution and infectious diseases. Therefore, it is necessary to give focus on the proper disposal of biomedical waste for the protection of environment and safety of people.

6.2. Sampling Design

A good sample is the true representative of the population.

6.2.1. Sample Frame

The list of total number of hospital in Agra was provided by Datta Enterprise (Common biomedical waste treatment facility) authorized by Central Pollution Control Board. It provides treatment and disposal facility for biomedical waste to all health care units in Agra.

6.2.2. Sampling Technique

For the purpose of this study, Stratified Sampling technique will be used for determination of sample size. In stratified sampling population is divided into segment, called strata and sampling is conducted separately in each stratum. Total number of hospitals was stratified by bed size.

6.2.3. Calculation of Sample Size

All hospitals were divided into six strata as given in Table: 2 and 10% of each stratum was taken as sample. Sample size is computed to be 47. Whole population was taken from stratum 150-200 and 900-950 because these strata contain one hospital. No sample size was taken from stratum 200-900 because no hospital comes in this stratum.

Table: 2 Calculation of Sample Size

No of Beds	No. of Hospitals N	10.% of the hospitals n
1-50	411	42
50-100	15	2
100-150	9	1
150-200	1	1
200-900	0	0
900-950	1	1
Total	437	47

6.3. Sources of Data Collection

For the purpose of study, both primary and secondary data will be collected.

6.3.1. Primary Sources

To fulfill the objectives of study, primary data will be collected from administrator and waste handlers of hospitals and operator and staff (Waste handlers) of common bio medical waste treatment facility of hospitals with the help of structured questionnaire, observation and checklist methods.

6.3.2. Secondary Sources

Secondary data is helpful to give information and fact related to biomedical waste management. Secondary data also provide detail issues and challenges regarding biomedical waste management that affect the success of effective implementation of biomedical waste management. Secondary data for this proposed study will be collected from Journals, Magazine, Newspapers, Books, and Website etc.

6.4. Tools of the study

The data from primary sources will be systematically arranged and tabulated in suitable manner and in order to assess the practices of Bio-Medical Waste Management, environmental auditing as management tool and relevant statistical tools will be applied which includes; Percentage, Average and etc.

Systems Approach tools like Causal loop diagram, Interpretive Structural Modelling etc. will be used for analyzing interactions among various issues associated with Bio-Medical Waste Management. It is often used to provide fundamental understanding of complex situation as well as to put together a course of action for solving a problem.

7. IMPLICATION OF THE STUDY

Proposed study will be helpful in finding shortcomings of the biomedical waste management. Recommendation and suggestion of the proposed study will help hospitals, government and improvement of the existing system. The findings and recommendations of this study will be helpful in decision making for the Government and Hospitals.

8. PROPOSED CHAPTERIZATION

The structure of the proposed study will be as follows:

Chapter 1. Introduction

Chapter 2. Review of Literature

Chapter 3. Research Methodology

Chapter 4. Analysis and Results

Chapter 5. Conclusion and Suggestions

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